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## Testing the Long-term Relationship between Banking Concentration, Interest Rates and Net Interest Margin: A Panel Study

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### Abstract

The current study aims to study the short and long-term relationship between the banking concentration of Jordanian commercial banks, interest rates and net interest margin using Panel data from (2007-2020), using the autoregressive distributed lag model. The study populations represents of 14 local commercial banks listed on the Amman Stock Exchange. To achieve the objectives and test hypothesis the E-views program was used. The empirical results revealed a long-term relationship between banking concentration, interest rates and net interest margin, and showed a positive impact on net interest margin in the long and short term.

Accordingly, the study suggested a set of recommendations, the most important of which was working to enhance competition in the Jordanian commercial banking sector, which makes monetary policy more efficient and reducing transaction costs and diversifying the bank's activities, in addition to reducing the most frequent interest margin to promote investment and growth in Jordan.

**Keywords:** Bank Concentration, Interest Rates and Net Interest Margin

### Introduction

One of the most important factors that measure the operational efficiency of banks is the net interest margin in terms of their management of savings and loan allocation. Some studies have shown that the high-interest margin related to the low-interest rates on customer deposits and the high-interest rate on loans granted will lead to a decrease in savings and an increase in the cost of lending, leading to a decrease in investment (Brock & Suarez, 2000). Conversely, the decrease in the interest margin cannot often be considered a positive indicator, especially for liberal regimes, because of the freedom to set and change interest rates by banks without the supervision of the central bank, which means the weak bank will continue its operations and thus adopt the policy of providing loans at low-interest rates to increase its market share, (Hamadi & Awdeh, 2012). The high net interest margin contributes to enhancing the strength of the banking system, especially when profits from high margins are directed to strengthening the capital bases of banks and thus confirming their primary role in supporting the economic growth of the state, (Saunders & Schumacher, 2000).

This study attempts to determine the relationship and its impact between banking concentration and interest rates as independent variables and the net interest margin as a dependent variable for Jordanian commercial banks in (2007–2020).

Jordanian commercial banks had achievements during the study period in supporting the stock market and providing credit facilities to individuals and institutions, which supported investment projects from the necessary funds. The main role of these banks was to manage assets and liabilities to maximise the net interest margin, capitalising on the bank's market value. The factors that affect the net interest margin of these banks must be determined. Thus, this study attempts to answer the following question

What is the relationship and impact of banking concentration with Jordanian commercial banks and interest rates on the net interest margin?

### **Hypothesis**

The study is based on two main hypotheses

1. There is a long-term equilibrium relationship between banking concentration in Jordanian commercial banks, interest rates and net interest margin within the boundary approach to simultaneous integration.
2. There is a significant positive effect of banking concentration and interest rates on the net interest margin.

### **Objectives of the Study**

This study aims to determine the factors affecting the net interest margin of Jordanian commercial banks and to make recommendations to help them create an appropriate climate to support and enhance these factors and thus maximizes the profits of banks, leading to their stability and success. The study also needs to address the factors that lead to a decrease in their profits and avoid them in the future. Thus, the study sheds light on the relationship between financial concentration in Jordanian commercial banks and interest rates and their impact on the net interest margin by using the methods of co-integration analysis, the most important of which is the developed boundary test for 2007–2020 to analyse the level relationships within the framework of the autoregressive distributed lag model (ARDL).

### *The Importance of the Study*

The net interest margin is an important indicator of the efficiency of the bank and an important criterion for customers to deal with, which means the availability of a strong investment environment. Therefore, the importance of the study stems from the need of banks and customers to know the relationship between financial concentration in Jordanian commercial banks and interest rates and their impact on the net interest margin. Few studies have addressed this topic.

### **Population**

The study population consists of 14 local Jordanian commercial banks (2007-2020) listed on the Amman Stock Exchange. The study excluded some banks due to their merging with other banks in the region.

### Sources of Data Collection

The necessary data for the study were collected directly and indirectly, and to review the financial reports and financial statistics issued by banks in addition to the companies' directory issued by the Jordan Securities Commission.

### Theoretical Framework and Experimental Studies

This study relied on a limited number of previous studies that tried to explain such a relationship. These studies were different in terms of the tool used and the results. Prao et al (2019), identified the Bank Concentration and Interest Rate Margin in WAEMU Zone. They showed that, in the short term, only the big four banks have a negative influence on net interest margins in the WAEMU zone. In the long term, the number of agencies in provinces and banking risks is positively linked to bank margin. Demirgüç et al (2013), analysed The Impact of Bank Regulations, Concentration and Institutions on Bank Margins. The data indicate that tighter regulations on bank entry and bank activities boost net interest margins. Inflation also exerts a robust, positive impact on bank margins, whereas concentration is positively associated with net interest margins. Furthermore, Leuvensteijn et al (2002), analyse the impact of loan market competition on the interest rates applied by euro area banks to loans and deposits in (1994–2004), using a novel measure of competition called the Boone indicator. We find evidence that stronger competition implies significantly lower spreads between a bank and market interest rates for most loan market products. Haruna (2012), shows that IMED, LLP and OE were the three most common factors that determine the commercial bank interest rate spread in all six models of measuring interest rate spread. This study therefore recommends that financial intermediation (IMED), operating expenses (OE) and Loan loss provision (LLP) be given top priority in understanding the variations in commercial banks' cost of financial intermediation whether measured using narrow or broad interest rate spread definition in Nigeria.

Azeez & Gamage (2013) the study investigates the impact of bank specific, industry specific and macro-economic variables on net interest margin of Sri Lankan commercial banks over the period of 1999-2011. The study found that the staff cost, capital cost, market power, inflation and T-Bill rate as positively influencing factors and management quality, statutory reserve requirement and GDP growth as negatively influencing factors on net interest margin. The study has further highlighted that there is no significant difference between the results of systematically important banks and whole sample banks with regard to the factors influencing net interest margin. Considering the prevailing high net interest margin, the findings imply that the management and policy makers need to focus on these factors to mitigate net interest margin in order for banks to act as important catalysts for higher economic growth in Sri Lanka.

Using panel data of 29 banks, (Khawaja & Din, 2007), show that the share of interest-insensitive deposits in total bank deposits is a key determinant of interest spread, whereas industry concentration has no significant impact on interest spread in Pakistan.

Almarzoqi & Naceur (2015), investigated the determinant of bank interest in the Caucasus and Central Asia. The study concluded that the interest spreads are affected by operating cost, credit risk, liquidity risk, bank size, bank diversification, banking sector competition and macroeconomic policies and depend on the country. Corvoisie & Gropp (2001), showed the bank concentration and retail interest rates and found that, for loans and demand deposits, increasing concentration may have resulted in less competitive pricing by banking. Daniel et al (2012), showed that operating expenses and credit risk have a positive and significant effect

on the net interest margin of the commercial banks in Kenya and found that growth and market concentration negatively impact net interest margin (Hussain, 2014). Banking industry concentration and net interest margins (NIMs) in Pakistan, showed that past NIMs, bank soundness, operating cost, industry concentration, relative market share, inflation, real depreciation and industrial growth have a statistically significant and positive impact, whereas diversification, changes in bank size, lagged liquidity and stock market development have dampening effects on NIMs. However, the impact of ownership, GDP and credit market development are statistically insignificant. Chortareas et al (2012). "Competition, Efficiency and Interest Rate Margins in Latin American Banking" showed that the concentration index and the market share have little or no influence on interest rate margins.

Study of (Al-Kor, 2011). This study aimed to test the effect of the concentration of assets according to the Structure –Conduct –Performance (SCP) model and the market share of deposits according to the Market Share (MS) hypothesis of traditional efficiency on the performance of Jordanian commercial banks, the results showed that the SCP model was rejected, thus excluding the alliance hypothesis between the most concentrated banks, and results that do not provide support for the traditional efficiency hypothesis. Using a unique bank-level data covering Russia's entire banking sector for the period (1999–2007), (Fungáčová & Poghosyan, 2008), find that the impact of a number of commonly used determinants such as market structure, credit risk, liquidity risk and size of operations differs across state-controlled, domestic-private and foreign-owned banks. At the same time, the influence of operational costs and bank risk aversion is homogeneous across ownership groups (Al Ali, 2012). This study aimed to determine the factors affecting the interest rate margin in some Syrian commercial banks, The study showed the existence of a direct statistically significant relationship between the interest rate margin, the operational banks index and the loans index, and the existence of an inverse statistically significant relationship between the interest rate margin and the equity rights index and exchange Rate (Almaita, 2020). The study aimed to identify the significant internal factors affecting net interest margin in Jordanian banks. The study used a sample of (13) Jordanian commercial banks listed in the Amman Stock Exchange during the period of 2006-2016. To achieve the objectives of the study, The researcher investigates the following independent variables: Ratio of Operating Expenses to Total Assets, Liquidity Ratio Capital Adequacy Ratio, Deposit Utilization Ratio, Financial Leverage Ratio, Bank Size. To determine the relationship between these variables, the study used Panel Data, Models Fixed Effect, Random Effect and Generalization Least Square (GLS) to test the hypotheses of the study. The results of this study are as follows: There is a statistically significant positive relationship between net interest margin in Jordanian commercial banks and the following factors: Ratio of Operating Expenses to Total Assets, Capital Adequacy Ratio, Deposit Utilization Ratio, and Financial Leverage Ratio. And there is a statistically significant negative relationship between net interest margin in Jordanian commercial banks and Liquidity Ratio. Also, there is a negative relationship that is not statistically significant between net interest margin in Jordanian Commercial Banks and Bank Size. The study recommends that commercial banks should pay attention to the management of operating expenses as they are the most important factors affecting the net interest margin of Commercial banks. Endri et al (2020), this study aimed to assess the impact of bank-specific factors and macroeconomic indicators on the net interest margin (NIM) of commercial banks in Indonesia. Data from Indonesian commercial banks are used. The results prove that the variables of Non-Performing Loans (NPL), Loan to Deposit Ratio (LDR), Return on Assets (ROA), Interest Rate (SBI), and Exchange Rate (FOREX) affect NIM. The exchange rate variable has a

predominant effect, while the NPL factor has a less strong influence on NIM (Khediri & Khedhiri, 2011), determinants of Net Interest Margins (NIM) in Tunisia and tests some of the bank's characteristics that are derived mainly from the dealership model. The research considers the heterogeneity of individual banks through the use of random-effect as well as fixed-effect models. It tests the robustness of the results by running the Wooldridge test for autocorrelation in panel data and robust cluster estimation. Operating Costs (OC) and Bank Capital (BC) are found to be consistent to the theoretical model implying positive association to NIM. In addition, NIM is positively related to Opportunity Costs of Bank Reserves (OCBR), Implicit Interest Payments (IIP) and negatively related to Quality of Management (QM).

## Methodology

Variables of the study and how to measure it; variables were classified into two groups

### 1. Dependent variable: Net interest margin

The interest rate margin is the dependent variable in this study and it is the difference between the costs paid by the borrowers and the interest paid to depositors, As the increase in risks, the increase in the volume of banking operations and the increase in variance will lead to an increase in the net interest margin, which is measured as follows:

$(\text{Interest income} - \text{interest expense}) / \text{total assets}$

According to the following studies; (Tafri, et al., 2009; Doliente, 2003; Angbazo, 1997).

### 2. Independent Variables

There are many factors that affect the net interest margin, the most important of which are:

-banking concentration

Market concentration leads to an increase in profits to unusual and non-competitive levels due to the impossibility of banks participating with each other.

The concentration Bank of will be calculated according to Rank(3) by dividing the assets of the three largest banks to the total assets of the banks included in the sample by using a scale of (HH), Herfinahl-Hirshman, Which is calculated through the sum of the square of the market share of assets for all commercial banks listed on the Amman Stock Exchange as follows:

$HHI = \sum (MS)^2$

Whereas, the measure of concentration according to HHI takes the idea of SCP better than the measure of concentration CR<sub>n</sub>, which takes the idea of relative market strength, RMP, (Jeon & Miller 2002).

-Interest Rate

The interest rate is the rate that the central bank pays on the deposits of commercial banks, and it is an indicator of the interest rates of commercial banks. According to the classical theory, the interest rate is a means to bring equilibrium and equality between saving and investment without regard to the income which they assumed to be constant at the level of full employment. While Keynes considers that money is a commodity like other commodities that are demanded for themselves and have a price represented in the interest rate, so the interest rate is determined based on the supply and demand for money, which is a price for giving up liquidity, (Ali 1999). The main interest rates archived by the Central Bank of Jordan were relied upon.

### Model of the Study

The study tests the long-term relationship between banking concentration, interest rates and net interest margin using ARDL, which includes a specific number of independent variables in their current and decelerating form. Pesaran, et al (2001), presented a new method called the bound test, which does not require that the basic variables be in the model, is integrated to the same degree. This method is used to test the existence of a long-term relationship between the dependent variable and the independent variables within the framework of ARDL. It tests the significance of the lag levels of the variables concerned by relying on the unrestricted equilibrium correction model (UECM). Accordingly, the equation related to the variables of the model under study takes the following form

$$Y_t = \beta_0 + \beta_1 C_t + \beta_2 R_t + \epsilon_t$$

Then, the first difference in the model is taken. Thus, the equation becomes as follows:

$$\Delta Y_t = \beta_0 + \beta_1 \Delta Y_{t-1} + \beta_2 \Delta C_{t-1} + \beta_3 \Delta R_{t-1} + \beta_4 \Delta Y_{t-2} + \beta_5 \Delta C_{t-2} + \beta_6 \Delta R_{t-2} + \epsilon_t$$

where ( $\Delta$ ) denotes the first difference, ( $\epsilon_t$ ) the error term, ( $Y$ )<sub>t</sub> the dependent variable, which is the net interest margin over time ( $t$ ),  $C$  the banking concentration and ( $R$ ) the interest rates. The ARDL test includes searching for the existence of a long-term equilibrium relationship between the model variables by testing the following null hypothesis:

$$H_0 = \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = 0$$

which states that there is no long-term equilibrium relationship between the variables versus the alternative hypothesis that there is a long-term co-integration relationship between the variables.

$$H_1 = \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq \beta_6 \neq 0$$

The value of  $F$  with the critical value proposed by Pesaran, was compared, where the limits of the minimum and upper critical values for the  $F$  statistic test the hypothesis that there is no co-integration between the integrated variables versus the alternative hypothesis with its existence.

The minimum critical value limit assumes that all variables are integrated of degree  $I(0)$ , which indicates no joint integration between the variables, whereas the upper limit assumes that all variables are integrated of degree  $I(1)$ , which implies a cross-integration relationship between the variables. However, if the calculated value of  $F$  is greater than the upper bound, the null hypothesis is rejected, that is, there is a joint integration relationship. If it is less than the minimum, the null hypothesis is accepted, and if the value of  $F$  is between the upper and lower limits, the result is inconclusive. Finally, we derive the ARDL specification for short-run moves by constructing an error correction model (ECM).

### Results

Co-integration test using autoregressive distributed lags model (ARDL)

Pesaran et al (2001), presented a modern approach to testing the extent to which the long-term equilibrium relationship is achieved and is called a bound test to confirm the existence of a long-term relationship, as shown in Table No. (1).

Table 1

*Bounds F-test for co-integration*

Significant	LB	UB	F-statistic
???	????	????	????
??	????	????	
????	????	????	
??	????	????	

Source: Prepared by the researcher based on E-VIEW program outputs

Through the results of the co-integration test, the F-statistic is greater than the tabular values of F for Pesaran. Therefore, the null hypothesis H<sub>0</sub> is rejected at the 5% level. Therefore, a joint integration relationship exists between the variables.

*Estimating the long-term relationship*

Based on the results that confirmed the existence of a long-term relationship, the following results were obtained:

Table 2

*Estimation Results for ARDL (1,1,1).*

Variables	Coefficient	Str. Error	t-statistic	Probability
X1	0.8534	0.18132	4.7069	0.0022
X2	-0.5778	0.09624	-6.0041	0.0005
C	-1.2355	1.38627	-0.89441	0.04009

Source: Prepared by the researcher based on E-VIEW program outputs

Through the above results, the parameter of banking concentration and the interest rate is statistically significant at the level of 5%. In economic terms, a positive relationship is found between banking concentration in commercial banks and the net interest margin. Thus, the higher the banking concentration by one unit leads to an increase in the net margin. The interest rate is 0.8534, and a negative relationship is found between interest rates and the net interest margin. As the interest rate increases by one unit, the net interest margin decreases by 0.5778.

*Estimation of the error correction model*

Given that no co-integration relationship exists between the long-run variables, we can estimate the short-run relationship using the error-correction model of the autoregressive distributed lags approach as follows:

Table 3

*Results of estimating the short-term relationship of the model.*

Variables	Coefficient	Str. Error	t-statistic	Probability
D(X1)	0.10705	0.34362	0.31155	0.76451
D(X2)	0.07070	0.14033	0.50381	0.62991
Coit Eq(-1)	-0.3452	0.29671	-4.5337	0.00271

Source: Prepared by the researcher based on E-VIEW program outputs

The results of estimating the ECM indicate that the error correction limit parameter is negative and less than one is true and significant, fulfilling the necessary condition for that.

The long term means that the speed of adjustment from the short term to the long term is 0.345.

#### Diagnostic Tests

To ensure the validity of the model and to rely on it for proper diagnosis and economic analysis, the following table shows the results of the diagnostic tests for the model.

Table 4

#### *Results of the Diagnostic Tests for the Model*

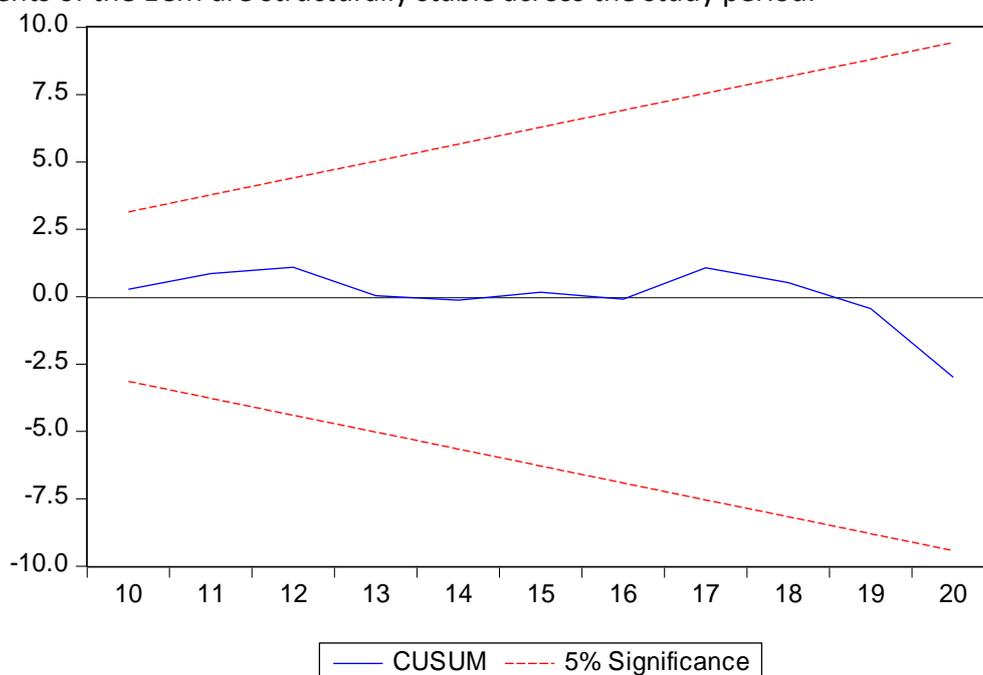
Test type	value	Probability
Serial correlation LM test	F-statistic 1.61102	0.2884
Jack-Berra	J.B:0.446338	0.7999
ARCH	F-statistic 1.244536	0.3815

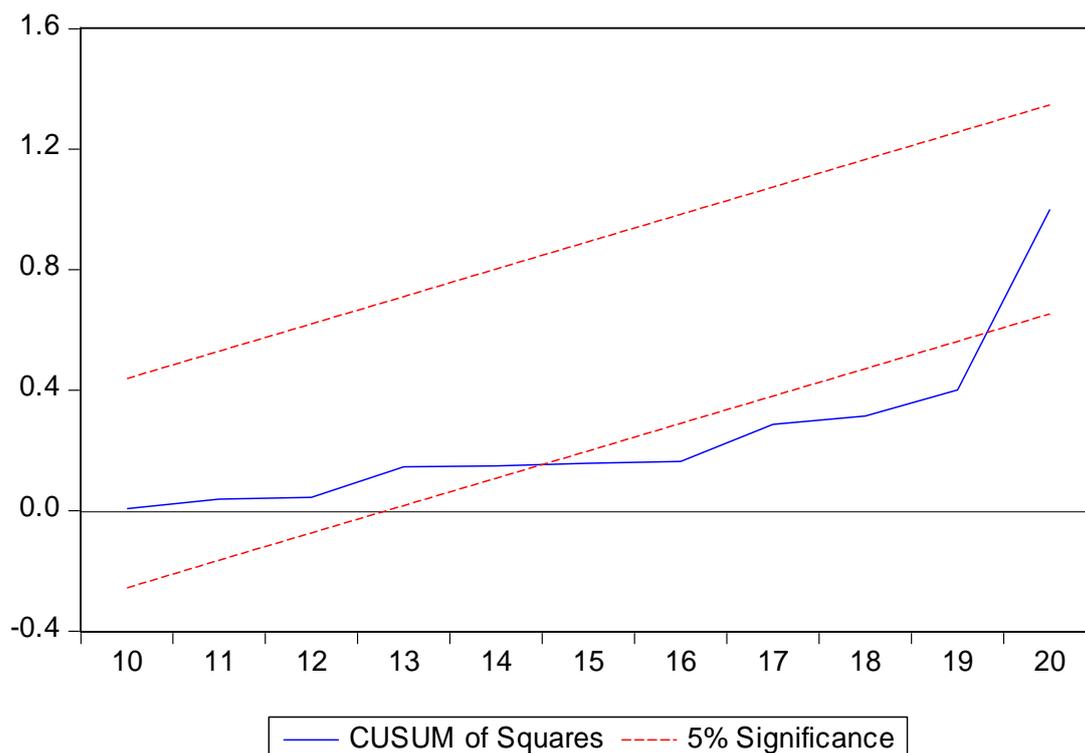
Source: Prepared by the researcher based on E-VIEW program output

The above table shows that all the probabilities are greater than 0.05. Therefore, we accept the null hypothesis in all tests at the significance level of 5%; accordingly, errors are not auto correlated according to the LM test. According to the JB test, the random errors are distributed normally, but according to the ARCH test, the variance of errors is homogeneous.

#### *Model Stability Test*

After estimating the error formula of the model, the structural stability of the short and long-term coefficients must be tested using the cumulative sum of the recursive residual test. If the graph of the Cusum and Cusum of squares test, which was suggested by Brown, Dublin and Evans (1975), falls within the critical limits at the 5% level of significance, the estimated coefficients of the ECM are structurally stable across the study period.





### Conclusion

The analysis results showed a positive relationship between the banking concentration in commercial banks and the interest margin. Therefore, the higher banking concentration by one unit led to an increase in the interest margin, a negative relationship between interest rates and the interest margin and the existence of a short-term equilibrium.

### Recommendations

1. Working to enhance competition in the Jordanian commercial banking sector, which makes monetary policy more efficient.
2. Reducing transaction costs and diversifying the bank's activities, in addition to reducing the most frequent interest margin to promote investment and growth in Jordan.
3. Improving the operational efficiency of banks to reduce the margin rate and the need to review the changing interest rates on the basis of the annual change in the weighted price of lending and borrowing transactions.
4. Conducting more studies on the net interest margin to determine its determinants and the factors affecting it.

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